TAXON 23(2/3): 227-228. MAY 1974

# I. EVOLUTIONARY SIGNIFICANCE OF CELL DIVISION PHENOMENA IN PROTISTS

## NONPHOTOSYNTHETIC PROTISTS

*Karl Grell**

*Abstract*

Nuclear dualism, i.e. the occurrence of two nuclei, different in structure and function within the same cell, is a phenomenon restricted to the heterokaryotic Foraminifera and to the ciliates. Though interesting similarities exist, there is no doubt that the phenomenon developed independently in both groups.

In the Foraminifera whose taxonomy is still based exclusively on the morphology of the shells, nuclear dualism is a striking "bridge of homology" connecting certain genera and species of the family Rotaliidae. As will be demonstrated, its variable expression gives some insight into the evolutionary process. However, other features such as the mode of sexual reproduction have to be considered too, if an attempt is made to clarify phylogenetic relationships.

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## PHOTOSYNTHETIC PROTISTS

*Jeremy Pickett-Heaps***

*Abstract*

In my opinion, the problem of accounting for the origin of eucaryotic cells cannot be dissociated from the problem of accounting for the origin of mitosis. A primeval cell type could not become eucaryotic unless it had concurrently evolved a method for reliably partitioning its genetic material.

Modern procaryotes perhaps had their genetic material attached to the cell membrane: partitioning may be accomplished by growth of the membrane between attachment points. The only possibly similar mechanism of chromosome separation so far described in eucaryotic cells may be in the dinoflagellates.

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Although cell division phenomena in many key genera are not yet described, a possible phylogenetic scheme, based in part upon original work in green algae, will be presented. Early forms of mitosis that utilized MTOC's (microtubule organizing centres) are thought to have preceded the origin of centrioles. The absence of centrioles in red algae is considered to be primitive. Closed spindles may also be primitive. Elongation during anaphase and "persistence" during telophase of the continuous spindle may have been an important and primitive property of an ancestral form, one that ensured that the two separated genetic complements (daughter nuclei) were held apart as the cleavage furrow (invagination of the cell membrane) grew between them. The interzonal spindle therefore may have evolved early: its elongation could have been brought about by the growth of rigid structural units (microtubules) controlled by polar entities (MTOC's) which had replicated and split before nuclear division. These polar entities could have been derived from sites of attachment of the primitive genomes to the nuclear envelope. The primitive eucaryotic chromosomes could originally have remained attached to these polar entities and have been drawn apart as they separated.

Thus the phylogenetic significance of euglenids, dinoflagellates, red algae and certain green algae will be discussed in the context of these ideas.

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